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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/039,309	11/07/2001	Eiji Sato	45672/56,682	2127

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EXAMINER
MONDT, JOHANNES P

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 04/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/039,309	SATO ET AL.	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

After-Final Amendment filed 4/12/2004 has been entered after consideration of the arguments (see "Response to Arguments"). Said After-Final Amendment forms the basis of this Official Action. In view of the After-Final Amendment, including Remarks, the Finality of the previous Office Action is herewith withdrawn.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. ***Claims 1, 6, 8 and 9*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al (6,377,321) in view of Okada et al (JP406102485A) and Takiguchi et al (6,351,299 B1). Khan et al teach a liquid crystal layer 22 (cf. col. 10, l. 42-47); a pair of substrates, e.g., 12 and 14 (cf. col. 10, l. 34-53), so as to interpose the liquid crystal layer there between, and a plurality of pixels arranged in matrix pattern (inherently so when the electrode configuration is in matrix pattern) (cf. col. 11, l. 5-19), wherein: the liquid crystal layer "has a helical structure" in the sense as disclosed by Applicant, i.e., has molecules with helical symmetry in it (cf. col. 9, l. 53 – col. 11, l. 3) (N.B.: inherently, cholesteric molecules have helical axes) and exhibits at least two stable states including

a planar state and a focal conic state according to an applied voltage (cf. col. 15, l. 36-51).

Khan et al do not necessarily teach a thickness d in each of the plurality of pixels to have to different values and the liquid crystal layer to include at least two regions having different values of a first threshold voltage for transitioning from the planar to the focal conic state.

However, the provision of thickness gradients within the liquid crystal layer so as to achieve a first threshold voltage difference for two regions within said liquid crystal layer would have been obvious in view of *Okada et al*, who teach said thickness to have a gradient in the liquid crystal layer, and thus have at least two different values (in fact all values between d1 and d2), as a means to achieve a gradient in the threshold voltage (cf. English abstract, "Constitution" and Figures 7 and 8(a)), and hence at least two different values in said threshold voltage.

Motivation to include the teaching by Okada et al into the invention by Khan et al stems from the desirability to avoid display instability, as explained by Okada et al (cf. English abstract, "Purpose"), while unstable displays are generically disadvantageous in the art of liquid crystal displays. *Combination* of said teaching with said invention is straightforward: the liquid crystal display by Khan et al also relies on helical molecules, being of the chiral nematic liquid crystal variety (cf. abstract), while variation, in particular the inclusion of a thickness gradient is easily achieved over the spatial extent of a cell. *Success* in implementing the combination can therefore be reasonably expected.

Neither Khan et al nor Okada necessarily teach the further limitation "wherein the thickness d of the liquid crystal layer satisfies a relationship of 1<d/P<15 with a helical pitch P of the helical structure". However, it would have been obvious to include said further limitation in view of Takiguchi et al, who teach as their Example 2 including a chiral nematic liquid crystal, as in Khan et al, a value of d/P =3.5/1.8 ≈ 1.94, which is in the range as claimed. A *prima facie* case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art or when the ranges of a claimed composition do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. In re Peterson, 65 USPQ2d 1379 (CA FC 2003).

On claim 6: in Okada et al the value of the thickness changes continuously across the pixels (cf. Figure 8a).

On claim 8: the upper surface of the lowest of the two substrates in Figure 7, hence the one closer to the liquid crystal layer than the other side of said substrate by Okada et al is concave as a whole.

On claim 9: the top surface of the bottom substrate in Figure 7 is concave, while the bottom surface of the top substrate in Figure 7 is both concave and convex according to the second definition of convex cited from Merriam-Webster (see rejection under 35 U.S.C. 112 of claim 8 given above).

2. ***Claim 3*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al, Okada et al and Takiguchi et al as applied to claim 1 above, and further in view of

Masazumi (6,414,669). As detailed above, claim 1 is unpatentable over Khan et al in view of Okada et al and Takiguchi et al. Neither Khan et al nor Okada et al nor Takiguchi et al necessarily teach the further limitation as defined by claim 3. However, it would have been obvious to define the thickness d in the manner as defined by claim 3 in view of Masazumi, who teaches in the analogous art of liquid crystal display devices with cholesteric phase (cf. col. 1, title and abstract) that the said first threshold voltage ("Vth2" in Masazumi, cf. col. 2, l. 1-23) for transitioning from the planar state to the focal conic state (cf. abstract and loc. cit.) is less than the second threshold voltage ("Vth1" and V1 in Masazumi, loc. cit.) (cf. Fig. 37).

Motivation to adhere to the teaching by Masazumi in this regard for the entire range of thicknesses is not to upset the driving method: if the condition that forms the basis of this claim were not met then for some portions of the pixel the homeotropic state would be achieved while other portions would remain in the focal conic state, which cannot be the intention of any liquid crystal device. Combination of the teaching by Masazumi in this regard in the invention by Khan et al, Okada et al and Takiguchi et al is readily achieved by proper bracketing of the thicknesses in the liquid crystal layer. Success in implementing the combination can therefore be reasonably expected.

2. ***Claims 4-5*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al, Okada and Takiguchi et al as applied to claim 1 above, and further in view of Ogawa et al (4,632,514). Although neither Khan et al nor Okada nor Takiguchi et al necessarily teach the further limitation as defined by claim 4, it would have been

obvious to include said further limitation in view of Ogawa et al, who, in a patent drawn to a multi-color liquid crystal display, teach variation of the thickness of the liquid crystal layer such that different abutting substantially flat or horizontal regions in a pixel electrode have different liquid crystal layer thickness for different color picture elements (cf. abstract and col. 3, l. 60-65) thus providing a staircase pattern (cf. abstract and Figures 15-16). Note that thickness increase is effected by a succession of a plurality of substantially flat or substantially horizontal regions (cf. Figures 15 1-6) and that in Figures 15-16 and 21-22 said thickness increases from the center to each end of the liquid crystal display.

Motivation to include the teaching by Ogawa et al in this regard is the minimization of optical rotatory dispersion thus improving quality of display (cf. abstract). On claim 5: the further limitation of claim 5 is met by the teaching by Ogawa et al for the differences in thicknesses for the three basic colors, the minimum crystal layer thickness difference between two colors being 0.6 μm (cf. col. 14, l. 5-29). Therefore, the quantity Δd minimally equals 0.6 μm, which when implemented in the invention by Khan et al as described above meets the claim, P being 0.36 μm. It is furthermore noted that the inequality that forms the essence of this claim hinges exclusively on a ratio $(P/(2\Delta d)$ that is a result-effective variable, depending on the desired portion of the electromagnetic spectrum (see, for instance, Ogawa et al, col. 17, l. 60-70, from which it follows that P is a function of the spectral domain, while we already have seen that Δd is as well) requiring only standard experimental skills and hence must be regarded as a design choice.

3. ***Claim 7*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al, Okada et al and Takiguchi et al as applied to claim 1 above, and further in view of Scherer et al (5,880,801). As detailed above, claim 1 is unpatentable over Kahn et al and Okada et al, who do not necessarily teach the further limitation of claim 7.

However, it would have been obvious to include said further limitation in view of Scherer et al, who teach top and bottom substrates 42 and 44, respectively (cf. col. 4, l. 20-60) to be aligned horizontally and vertically, respectively, so as to achieve hybrid-aligned cells by which an electro-optic response is achieved at low voltage compared with a device with pure homogeneous alignment (cf. col. 3, l. 29-47).

Motivation to include the teaching by Scherer into the invention by Khan et al, Okada et al and Takiguchi et al in this regard stems from the desirability to achieve response at low voltage (Scherer, loc.cit). Combination of said teaching and said invention is straightforward through the process to make HAN crystal cells as disclosed by Scherer et al (cf. col. 3, l. 7-47). Success in implementing said combination can therefore be reasonably expected.

Response to Arguments

Applicant's arguments, see, filed 4/12/2004, with respect to the rejection of claim 2 have been fully considered and are persuasive. The rejection of claim 2 has been withdrawn. The incorporation of claim 2 into claim 1 through its amendment prompts, however, a modified rejection in which Takiguchi et al is cited, as explained above in the

rejection of claim 1, which rejection renders the arguments in Remarks on page 2 on the limitation the crystal layer thickness range (1<d/P<15) moot. The rejections under 112, first and second paragraph, have been withdrawn in light of the after-final amendment.

With regard to claim 3 the traverse by Applicant is moot in view of the new rejection based additionally on Ogawa et al. Applicant alleges that Masazumi does not teach, mention or suggest defining the thickness d of the liquid crystal layer so that the first threshold voltage for transitioning the liquid crystal layer included in a region with largest thickness d of the liquid crystal layer from the planar state to the focal state is less than a second threshold for transitioning the liquid crystal layer included in a region with a smallest thickness d of the liquid crystal layer from the focal conic state to a homeotropic state. However, the further limitation as defined by claim 3 only requires an inequality between V_{thmax} and V_{thmin} as defined in said further limitation.

Finally, traverse of the rejection of claim 7 appears only based on the traverse of independent claim 1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 571-272-1919. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JPM
April 23, 2004

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